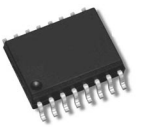
STM-2116

1800 - 2100 MHz High Linearity Active Transmit Mixer

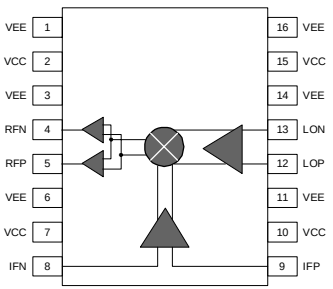


16 pin TSSOP with Exposed Ground Pad
Package Footprint: 0.197 x 0.252 inches (5.0 x 6.4 mm)
Package Height: 0.039 inches (1.0 mm)

Product Description

The Sirenza Microdevices' STM-2116 is a high linearity active mixer for use in a wide variety of communication systems covering the 1800-2100 MHz frequency bands. This device operates from a single 5V supply and provides 16 dB of conversion gain while requiring only 0dBm input to the integrated LO driver. The STM-2116 also includes an integrated on chip IF amplifier and is fabricated using Silicon Germanium (SiGe) device technology.
All ports can be driven differential or single ended (refer to applications note AN-057). Each broadband port has been designed to minimize performance degradation while operating into highly reactive components such as SAW filters. The device is packaged in an industry standard 16 pin TSSOP with exposed paddle for superb RF and thermal ground.

Functional Block Diagram



Product Features

- **Active mixer with 16 dB conversion gain**
- **Integrated 0dBm LO drive and IF amplifier**
- **Differential or single-ended inputs/output**
- **Single supply operation (+5V)**
- **Broadband resistive 50Ω impedance on all three ports**
- **Low LO-RF leakage**

Applications

- **Cellular/PCS/CDMA2000 transmitters**

Product Specifications

Parameters	Test Conditions: T_A = 25ºC, V_{CC} = 5.0V, P_{LO} = 0dBm, P_{IF} = -20dBm, IF = 200MHz	Unit	Min.	Typ.	Max.	Min.	Typ.	Max.
RF Frequency Range		MHz	1800		2000	2000		2100
LO Frequency Range		MHz	1600		1800	1800		2000
IF Frequency Range		MHz	30	200	400	30	200	400
Conversion Gain		dB	15	17	19	13	16	18
SSB Noise Figure		dB		9.5	11		9.5	11
Output IP3	IF1 = IF2 = -20 dBm/tone, 1 MHz spacing	dBm	20	24		17	21	
Output P1dB		dBm	8	11		6	9	
Leakage (LO-RF)		dBm		-20	-10		-20	-10
Leakage (LO-IF)		dBm		-45	-35		-45	-35
RF, LO, IF Return Loss	Matched to 50Ω, see Note 1, page 3	dB		14			14	
Supply Voltage (Vcc)		V	+4.75	+5.0	+5.25	+4.75	+5.0	+5.25
Supply Current		mA		200			200	
LO Drive	Matched to 50Ω	dBm	-3	0	+3	-3	0	+3
Thermal Resistance	junction-case	ºC/W		25			25	

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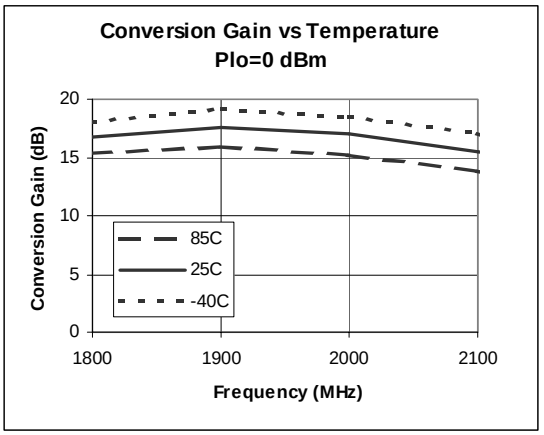
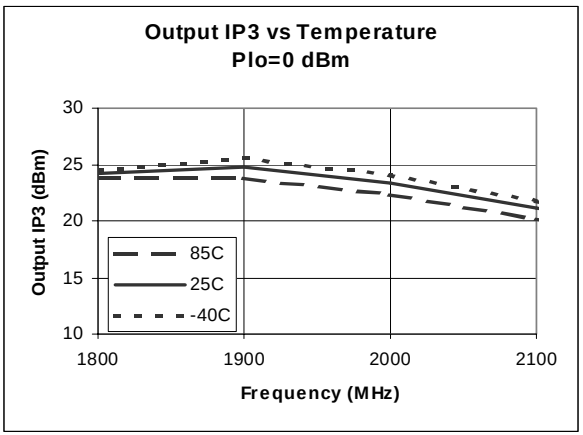
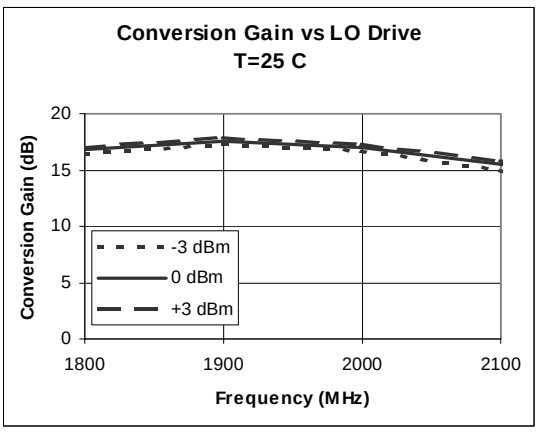
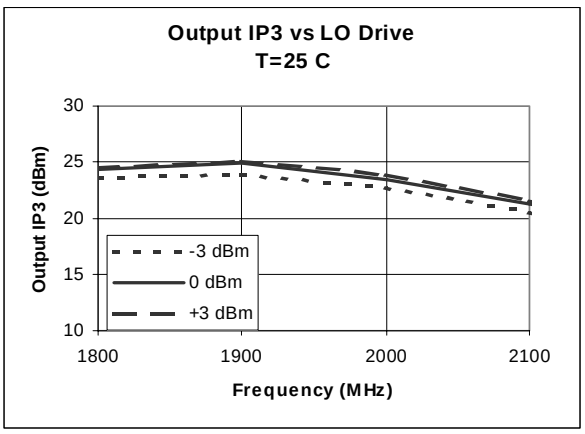
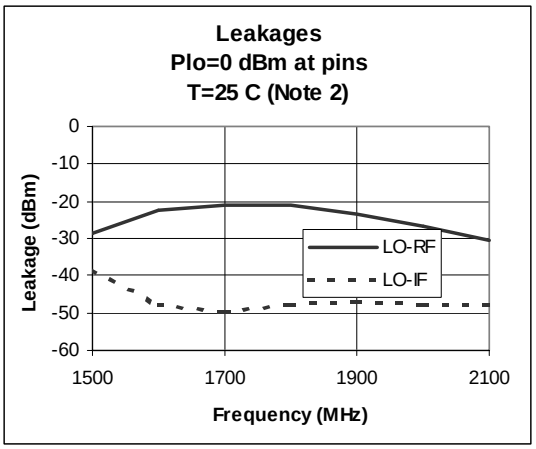
1800-2100MHz Typical Device Performance

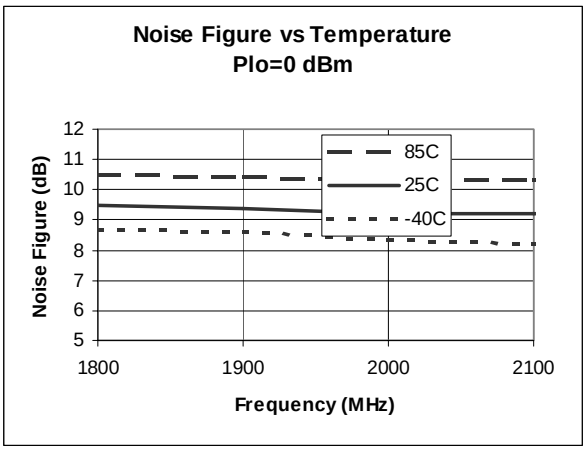




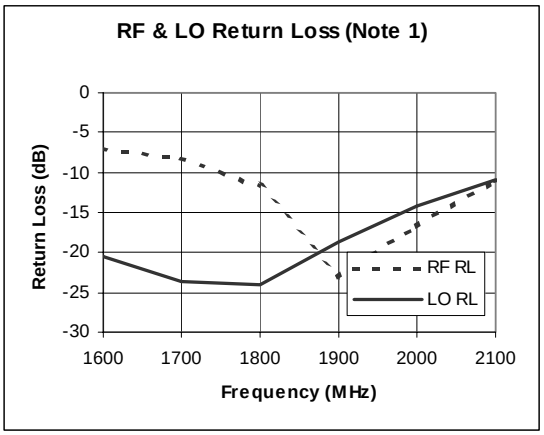


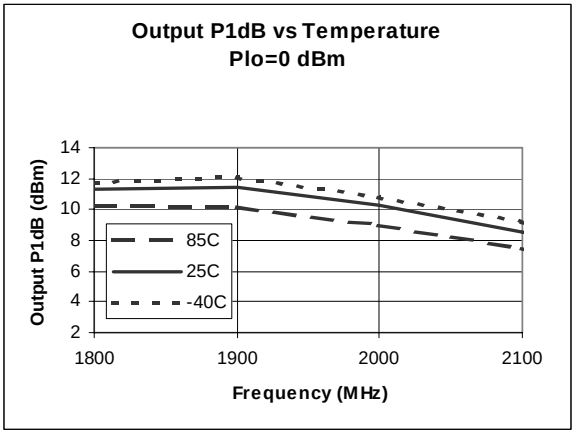


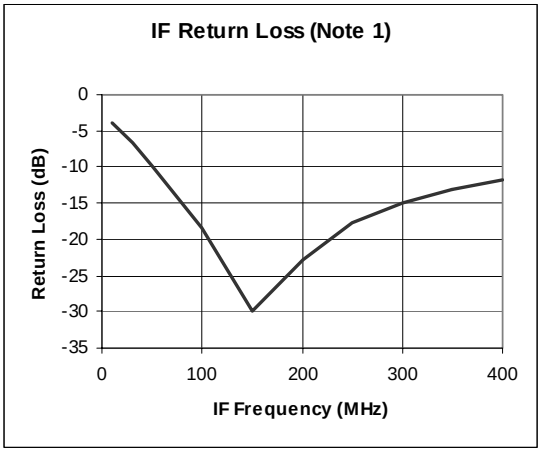


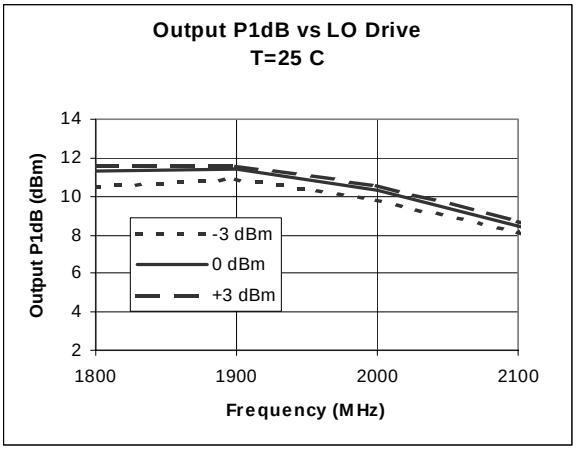


1800-2100MHz Typical Device Performance (continued)



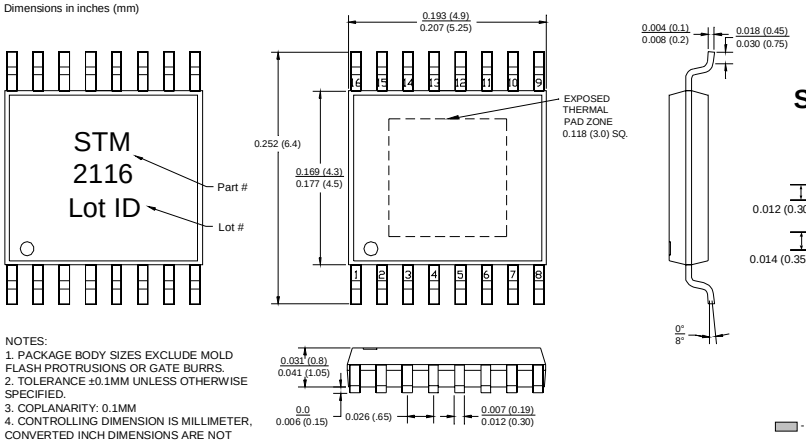






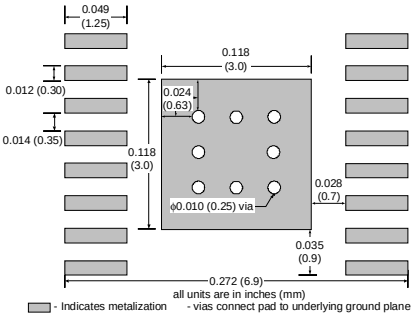
Note 1: The return losses shown were measured with the STM-2116 mounted on our FR4 evaluation boards . The RF port was matched for the PCS band, and the IF port matched for 200 MHz. Similar return losses are achievable at other frequencies using standard matching practices.
Note 2: LO-IF leakage measurement has not been adjusted for the loss through the IF (TC1-1) balun.

Package Dimensions ("16" Package)



NOTES:
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.
2. TOLERANCE ±0.1MM UNLESS OTHERWISE SPECIFIED.
3. COPLANARITY: 0.1MM
4. CONTROLLING DIMENSION IS MILLIMETER, CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. FOLLOWED FROM JEDEC MO-153.

Suggested PCB Pad Layout



Pin Out Description

Pin #	Function	Description	Additional Comments
1	VEE	Ground	
2	VCC	Positive supply (+5V)	
3	VEE	Ground	
4	RFN	RF output, negative terminal	Nominal DC voltage is 2.3V. (Internally biased) Output should be AC-coupled.
5	RFP	RF output, positive terminal	Nominal DC voltage is 2.3V. (Internally biased) Output should be AC-coupled.
6	VEE	Ground	
7	VCC	Positive supply (+5V)	
8	IFN	IF input, negative terminal	Nominal DC voltage is 2.3V. (Internally biased) Input should be AC-coupled.
9	IFP	IF input, positive terminal	Nominal DC voltage is 2.3V. (Internally biased) Input should be AC-coupled.
10	VCC	Positive supply (+5V)	
11	VEE	Ground	
12	LOP	LO input, positive terminal	Nominal DC voltage is 2.3V. (Internally biased) Input should be AC-coupled.
13	LON	LO input, negative terminal	Nominal DC voltage is 2.3V. (Internally biased) Input should be AC-coupled.
14	VEE	Ground	
15	VCC	Positive supply (+5V)	
16	VEE	Ground	

Absolute Maximum Ratings

Parameters	Value	Unit
Supply Voltage (Vcc)	+6.0	V_{DC}
LO Input (LOP+LON)	+10	dBm
IF Input (IFP, IFN)	+15	dBm
Operating Temperature	-40 to +85	ºC
Storage Temperature	-65 to +150	ºC

Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation the device voltage and current must not exceed the maximum operating values specified in the table on page one.

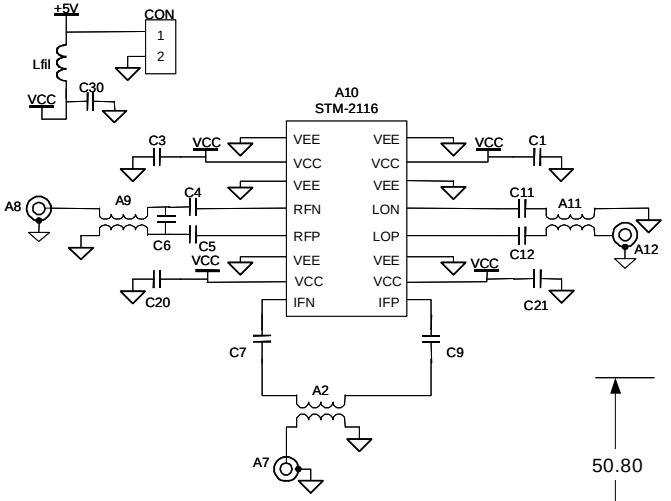
Part Number Ordering Information

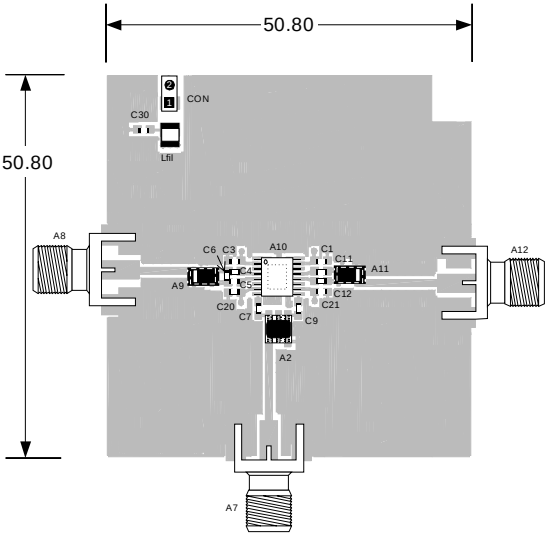
Part Number	Reel Size	Devices/Reel
STM-2116	7"	1000

Moisture sensitivity level 1 - no special handling required

Caution: ESD Sensitive
Appropriate precaution in handling, packaging and testing devices must be observed.

1800-2100MHz Application Schematic

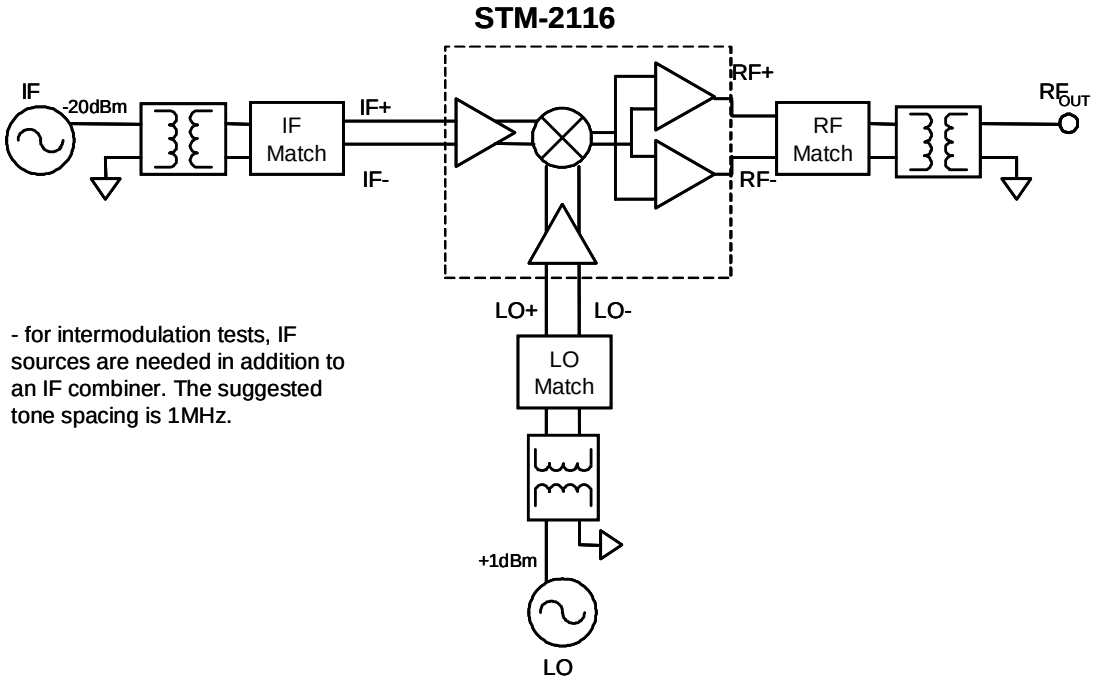




Bill of Materials (for 1800-2100MHz Evaluation Board P/N EEB102197)

Component Designator	Value	Qty	Vendor	Part Number	Description
A10		1	SMDI	STM-2116	SiGe Transmit Mixer
A7, A8, A12		3	Johnson Components	142-0701-851	SMA connector, end launch with tab, for 62 mil pitch thick board
CON		1	Panasonic	S1212-36-ND	2-pin header
A9, A11	1:1	2	Panasonic	EHF-FD1619	RF transformer
A2	1:1	1	Mini-Circuits	TC1-1	IF transformer
Lfil	1uH	1	Panasonic	ELJ-FA1R0KF2	Inductor, 1210 footprint, min. 200mA rating
C1, C3, C20, C21, C30	6.8pF	5	Venkel	C0603COG500-6R8CNE	Capacitor, 0603 footprint
C7, C9	100pF	2	Venkel	C0603COG500-101JNE	Capacitor, 0603 footprint
C4, C5	3.3pF	2	Venkel	C0603COG500-3R3CNE	Capacitor, 0603 footprint
C6	1.2pF	1	Venkel	C0603COG500-1R2CNE	Capacitor, 0603 footprint
C11, C12	4.7pF	2	Venkel	C0603COG500-4R7CNE	Capacitor, 0603 footprint

SiGe Transmit Mixer: General Test Set-Up



- for intermodulation tests, IF sources are needed in addition to an IF combiner. The suggested tone spacing is 1MHz.